HERIOT WATT UNIVERSITY | IMPEE Lecture Series

# From Shock Waves to Lunar Dust: Exploring the Frontiers of Aerospace Flow Physics




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**Abstract:** From aircraft travelling at supersonic speeds to spacecraft descending towards the Moon and Mars, complex flows present challenges at the intersection of fundamental physics and engineering design. This lecture will explore how shock waves, compressible flows and fluid–surface interactions can be understood through innovative experiments, advanced flow diagnostics and predictive modelling. Drawing on research at the University of Glasgow's Aero-Physics Laboratory, examples will illustrate how high-speed visualisation, schlieren imaging and particle image velocimetry reveal flow structures and transient phenomena that are otherwise difficult to observe. The lecture will then move from terrestrial aerodynamics to planetary exploration, examining how rocket exhaust plumes interact with loose regolith during landing, producing craters, ejecta and dust clouds that threaten spacecraft and surface infrastructure. Particular attention will be given to the ESA-designated Plume-Regolith Testing Facility and its contribution to experimentally grounded models and mitigation strategies. The lecture will conclude by highlighting opportunities for interdisciplinary engineering research connecting aerodynamics, propulsion, materials, diagnostics and sustainable space exploration.


**About Speaker:** Professor Kostas Kontis FREng, HonFRAeS, FAIAA, FIMechE, CEng is the Mechan Chair of Engineering and Professor of Aerospace Engineering at the University of Glasgow, where he directs the Aero-Physics Laboratory. He also serves as Dean for Global Engagement – East Asia and China. His research spans high-speed and compressible flows, shock-wave physics, plasma flow control, advanced optical diagnostics, spacecraft plume–regolith interactions and ISRU. He led the establishment of Glasgow's ESA-designated Plume-Regolith Testing Facility, supporting experimental research on the challenges of landing on planetary surfaces. A Fellow of the Royal Academy of Engineering and recipient of a 2021 NATO Science and Technology Team Excellence Award, he has led international research collaborations across academia, industry and space agencies. University profile: https://www.gla.ac.uk/schools/engineering/staff/konstantinoskontis/